FG (French Grammar)

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Abstract

This document presents FG, a unification categorial grammar for French. The salient characteristics of FG are given in section 1, stressing differences with respect to standard UCG. Section 2 describes the grammar structure. Section 3 presents the flow of information between concatenating signs: (i) the four basic UCG operations, (ii) the formal peculiarities of FG, (iii) the underlying variables ruling word ordering, (iv) the feature-based encoding of the information related to these variables, (v) the accounting for word order without order values, (vi) the accounting for non adjacent linearity phenomena and finally (vii) the general principles underlying the encoding of information in lexical entries. Section 4 presents FG coverage.

See also

Gabriel G. Bès, Karine Bashung, *Feasibility of a GPSG French grammar*, ACORD ESPRIT Project 393, November 1985. <hal-01101321>

Gabriel G. Bès, Claire Gardent, "French Order Without Order", *Proceedings of the Fourth Conference of the European Chapter of the Association for Computational Linguistics*, p. 249-255, 1989. <hal-01021826>

Claire Gardent, Gabriel G. Bès, Pierre-François Jurie, Karine Baschung, "Efficient Parsing for French", *Meeting of the Association for Computational Linguistics*, p. 280-287, 1989. <halshs-00372914>

Gabriel G. Bès (dir.), *Technical Documentation*, ACORD ESPRIT Project 393, Laboratoires de Marcoussis, December 8 1989. <hal-01143506>

Gabriel G. Bès, Thierry Guillotin (eds), *A Natural Language and Graphics Interface: Results and Perspectives from the ACORD Project*, Springer, 1992. <hal-01096792>

Karine Baschung, Gabriel G. Bès, Thierry Guillotin, "French Unification Categorial Grammars", *in* Gabriel G. Bès, Thierry Guillotin (eds), *A Natural Language and Graphics Interface; Results and Perspectives from the ACORD Project*, Springer, p. 23-46, 1992. <halshs-00371433>

Motivation and acknowledgements

We have now been working on the adaptation of UCG to French, with particular emphasis on interrogative structures, for about twenty months. We are not satisfied with the solutions of the standard UCG French grammar, i.e., FDP in its different versions.

The reasons for this have been partially indicated in previous reports. They are not the concern of this document.

Instead, we present here FG.

Besides the lack of satisfaction with FDP, the motivation for FG is to show that the UCG model has under-exploited potentialities for handling linguistic phenomena, in particular the intrincate pattern of linear ordering in written French. FG is not a new model or a new formalism (we feel that there are too many in the present market). FG is an experimental grammar, which adapts UCG to French. It thus conserves the basic UCG properties. It is implemented in PIMPLE with strictly no modification of this environment. The fact that this document emphasizes the differences wrt standard UCG must not obscure this central issue.

If our tentative proposal becomes entirely successful (certainly, this will not happen), the UCG model would exhibit its capacity to account for linear ordering at a (nearly) universal level. Within European projects, this will mean that it will be possible to treat romance and germanic languages within the categorial and unification environment of UCG. If our tentative proposal reveals itself inadequate or misguided, we hope that nevertheless there will be positive derived benefits. Some of the linguistic analysis incorporated into FG (but not all of them) can be translated into standard UCG, offering thus a solution - if only a temporary one - for vexing unsolved problems (the anaphora information of modifiers, for example). In any case, if the search for principled models is a real goal of the ACORD project - and not just an elegant but vacuous program - FG - even its failure - can greatly contribute to it. Last but not least, it is useful to recall that the failure of solution A does imply neither that a parallel different solution B is a good one nor that problems raised while working on the solution A are not real ones. So we claim that if the embryonic solutions here proposed are wrong, there is at present no satisfactory way of dealing with linear order in the UCG pattern(1).

In behalf of CLF contributors, I thank Ewan Klein for several private discussions which have encouraged me to develop underlying FG ideas. The creative curiosity of Henk Zeevat was a fundamental factor of progress : Zeevat's questions, arising from our official ACORD reports, greatly motivated us. In the same vein, discussions with Jo

our official ACORD reports, greatly motivated us. In the same vein, discussions with Jo Calder and Mike Reape help us significantly. Spurious ambiguities perturbated us greatly ; no solution is offered here to them, but our present basic assumption derives from discussions with Glyn Morrill. FG was presented at Stuttgart during a two week seminar (July 88) : questions and discussions with Ch. Rohrer, ... and again H. Zeevat, ... contributed significantly to the clarification of the issues involved.

The work on FG has been carried out in the ACORD project in addition to other contractual work. The responsibility for both scientific choices in FG and the opportunity of working in FG is entirely mine.

G.G. Bès.

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§1 presents an overview of FG. The sign and rules of FG are described in §2. §3 shows in detail the flow of information. The actual linguistic coverage will be presented in §4.

- X -

ESPRIT PROJECT 393 ACORD

Construction and Interrogation of Knowledge Bases
using Natural Language Text and Graphics

FG
(= French grammar)

§1 to §3

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DRAFT

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Note préliminaire

Bien qu'incomplet, le rapport ci-joint est censé présenter de manière détaillée les analyses linguistiques sous-jacentes à FG et leur implémentation dans une grammaire catégorielle dérivrée de UCG.

Les travaux sur FG ont conduit à une révision plus importante du modèle original. Dans celle-ci, le système de traits avec ses fonctionnalités pour l'expression de l'ordre subsiste entièrement, mais les valences prédicatives ne sont pas traitées comme relevant d'une liste mais d'un ensemble. Ceci a permis, parmi d'autres, l'élimination de la règle de la permutation. Les résultats de ces travaux apparaissent dans les communications aux ACL de Manchester et Vancouver, ci-jointes.

Contents

French order without order, by G.G. Bès & C. Gardent

Efficient parsing for French, by C. Gardent, G.G. Bès, P.-F. Jurie and K. Baschung

1 - FG overview

The salient FG characteristics are presented intuitively in this paragraph, stressing differences wrt to standard UCG.

(a) Sign syntax

The FG sign is :
category : features : semantics : rule management : phonology
/ \
Op Per

Access to the "features" domain is independent from access to the category domain : it is thus possible to access feature information independently from the Catlist, which is in the category domain. The two branches of the rule management domain govern Op(tionality) and Per(mutation). There is no special domain for Order.

(b) In FG the only concatenational FG rules are FA and BA. They differ in only one point wrt the classic UCG rules : the features of the resulting concatenated sign are partially determined by features from the active sign of the functor, and partially by features from the argument.

(c) FG incorporates no unary rule modifying or adding valencies to verbal signs. The only two unary rules are Deletion and Permutation. They operate in the valencies list of verbal signs and their goals are to erase optional valencies and to permut specified ones, respectively.

(d) No specific order value is associated with each verbal valency. Contrary to the categorial tradition, neither np-nom is marked "pre" and np-obj as "post", nor directional slashes are utilized. In French, the nominative valency can be placed (1) to the left of the verb, or (2) to the right, or (3) between the auxiliary and the participle in complex verb forms, or (4) to the left and to the right, or (5) to the left and between the auxiliary and the verb :

(1) *Jean* aime Marie
(2) Quel livre regarde *Marie* ?
(3) A-t-*il* aime Marie ?
(4) *Jean* aime-t-*il* Marie ?
(5) *Jean* a-t-*il* aimé Marie ?

Analogous observations can be made wrt other verb valencies. Thus, there is no linguistic justification for the association of a particular valency with a particular

order value : in all cases where the value is incorrect, it is necessary to introduce by some ad hoc means effects which ought to be derived from the correct one.

In FG, features - which are in general related to morphological characteristics - specify the general underlying conditions governing the concatenation of specific constituents. When the conditions stated by features are fulfilled, it is possible to obtain the effects of linear ordering, which otherwise require the incorporation of "pre" and "post" as primitives. The flow of information determined features is explained in detail in §4.

(e) Valencies of specific predicates are specified in lists, but the underlying idea of FG is that, linguistically, at least in French, valencies must be treated as sets or as partially ordered sets. In lexical verbal entries, the nominative valency is placed at the head of the Catlist. Moreover, clitic entries (among which we include *t-il*) are so designed that clitics concatenate first. So the order of concatenation is :

(a) clitics (if any)
(b) non clitic subject
(c) other constituents

Examples :

(6) *Jean lui donne un livre*
(a) lui donne
(b) Jean _____
(c) _____ un livre

(7) *Jean lui donne til un livre ?*
(a) donne til
(b) lui
(c) Jean _____
(d) _____ un livre

(8) *Quel livre lui donne Jean ?*
(a) lui donne
(b) _____ Jean
(c) Quel livre _____

The placement of the subject in (6b), (7a) and (8b) allows us to characterize each derivation as being of the standard (= st), inversion 1 (= inv1) or inversion 2 (= inv2) type. These are the three basic organisations of the French clause ; each one has subsequent effects on linear ordering.

The placement of the nominative valency at the beginning of the list also allows us to treat agreement relations between the auxiliaries and the verb smoothly.

The non-nominative verbal valencies associated with verbal arguments, although implemented as a list, are linguistically analyzed as being members of a set.

Even if the exhaustive revision of all French verbs have not been yet achieved, it is possible to say that the following generalisation is true for a very large and significant class of verbs (wrt to standards of adequacy in computational linguistics, it is a very strong and well established generalisation).

(9) If a verb categorizes for a pair ‹a,b›, it also categorizes for a pair ‹b,a›, where *a* and *b* are non clitic and non nominative arguments placed to the right of the verbs.

The following are typical examples

(10)(a) Jean donne un livre à Marie.
Jean donne à Marie un livre.

(b) Jean a dit à Marie qu'il viendra.
Jean a dit qu'il viendra à Marie.

(c) Jean parle de ce livre à Marie.
Jean parle à Marie de ce livre.

(d) Jean juge Marie idiote.
Jean juge idiote Marie.

(e) Jean a acheté pour cinq francs ce livre.
Jean a acheté ce livre pour cinq francs.

(f) Jean joue aux cartes avec Marie.
Jean joue avec Marie aux cartes.

(g) Jean a nommé Pierre président.
Jean a nommé président Pierre.

(h) Jean ordonne à Marie de venir.
Jean ordonne de venir à Marie.

(i) Jean promet à Marie de venir.
Jean promet de venir à Marie.

(j) Un livre a été donné par Jacques à Marie.
Un livre a été donné à Marie par Jacques.

(k) Donne un livre à Marie.
Donne à Marie un livre.

The generalisation in (9) is valid also for interrogative constituents.

(11)(a-1) Jean donne | quoi / quel livre | à Marie ?

(a-2) Jean donne à Marie | quoi / quel livre | ?

(a-3) Jean donne | quoi / quel livre | a | qui / quelle fille | ?

(a-4) Jean donne a | qui / quelle fille | | quoi / quel livre | ?

(a-5) Jean donne un livre | à qui / à quelle fille | ?

(a-6) Jean donne | à qui / à quelle fille | un livre ?

(b) Jean a dit a qui qu'il viendra ?
Jean a dit qu'il viendra à qui ?

(c) Jean parle de quoi à qui ?
Jean parle à qui de quoi ?

(d) Jean juge Marie comment ?
Jean juge comment Marie ?

(e) Jean a acheté pour combien ce livre ?
Jean a acheté ce livre pour combien ?

(f) Jean joue aux cartes avec qui ?
Jean joue avec qui aux cartes ?

(g) Jean a nommé qui président ?
Jean a nommé président qui ?

(h) Jean ordonne à qui de venir ?
Jean ordonne de venir à qui ?

(i) Jean promet à qui de venir ?
Jean promet de venir à qui ?

(j) Un livre a été donné par qui à Marie ?
Un livre a été donné à Marie par qui ?

The generalisation in (9) is valid in negative sentences

(12)(a-1) Jean ne donne pas un livre à Marie.
Jean ne donne pas à Marie un livre.

(a-2) Jean ne donne aucun livre à Marie.
Jean ne donne à Marie aucun livre.

(b) Jean n'a dit à personne qu'il viendra.
Jean n'a dit qu'il viendra à personne.

(c) Jean ne parle de ce livre à personne.
Jean ne parle à personne de ce livre.

(d) Jean ne juge aucune fille idiote.
Jean ne juge idiote aucune fille.

(e) Jean n'a acheté aucun livre pour cinq francs.
Jean n'a acheté pour cinq francs aucun livre.

(f) Jean ne joue aux cartes avec personne.
Jean ne joue avec personne aux cartes.

(g) Jean n'a nommé personne président.
Jean n'a nommé président personne.

(h) Jean n'ordonne à personne de venir.
Jean n'ordonne de venir à personne.

(i) Jean ne promet à personne de venir.
Jean ne promet de venir à personne.

(j) Aucun livre n'a été donné par personne à Marie.
Aucun livre n'a été donné à Marie par personne.

(k) Ne donne à personne un livre.
Ne donne un livre à personne.

(13) If a verb categorizes for a pair ‹a,b› it categorizes also for a pair ‹c,d›, where

(a) *a* and *d*, *b* and *c* are clitics which consume a particular valency

(b) order between members of each pair (which is not related to valency arguments but to morphological classes) is respected.

Observe that (13) does not require for clitics in each pair to be morphologically the same, but that restrictions on clitic placement must be respected.

Examples of (13) are presented in (14)

(14) Jean le (obj) lui (dat) donne
Jean se (dat) le (obj) donne

The generalisations in (9) and (13), supported by the illustrations in (10), (11), (12) and (14) make it very difficult to understand why a list .../np obj/np dat/... should be prefered to a list .../np dat/np obj/... or vice versa. Neither from syntax nor from semantics (scope of negative constituents or of interrogatives or plurals) nor

from anaphora resolution, have we been able to derive some piece of evidence showing that in some way or another there is some significant difference related to an order relation between non nominative arguments of a verb. We assume thus that verb subcategorisation is better expressed by (a,b) rather than by ‹a,b› plus operations introducing the effects of ‹b,a›.

PIMPLE is the computational environment where UCG grammars can be implemented. PIMPLE is a PROLOG and term unification based system in which PATR II grammars can be declaratively implemented. So we are placed in some rather unconfortable position, trying to satisfy two goals which seem to be in conflict :

(15)(a) Verb-subcategorisation must be expressed as a set
(b) The PIMPLE environment must not be changed.

The conflict in (15) has been solved in FG by two more or less ad-hoc means :

(16)(a) Rigid order
(b) The permutation rule

Rigid order underlies the analysis of clitics (cf. 4.1). It is founded in a very simple idea : because order between valencies is not significant, it is possible to assign to each different syntactic type of valency a predetermined place in a list. This means that, for example, the dative valency can be characterized as the np sign which is situated in all verbs in the place n° 3 of the Catlist.

The permutation rule inverts, under certain conditions, the first two valencies of a list (cf. 2.2). It reffects the analysis of free order relations among constituents other than clitics.

(f) Modifiers. FG, like UCG, is a lexicalist grammar. As such, each lexical entry encodes a maximum of information governing its subsequent concatenations. This general principle justifies the incorporation of the nominative valency into each verbal entry. By the same token, FG verbal entries incorporate a modifier valency which, depending on particular verbs, can be optionally deleted (the general case) or not (in verbs such as *habiter*). Modifiers are recursively consumed and reintroduced by prepositional phrases or adverbs. Besides its primitive function, the modifiers valency also plays a crucial role in unbounded dependencies and non-adjacent conditions on order.

(g) Linearity phenomena are basically of two different types : (a) local, (b) non-adjacent.

In local linearity phenomena, conditions of concatenation are entirely determined by the two adjacent concatenating signs. For example, in (17), the lexematic NP *Marie* placed to the right of the verb can consume an object valency. Once the concatenation with (a) is achieved, leading to (b), no further condition introduced by the concatenation of *Marie* must be fulfilled in (b) to assure its grammaticality.

(17) (a) *Jean regarde*
(b) _____ Marie

The pattern of non-adjacent linearity phenomena is as follows : A sign A - either a lexical entry or a sign already obtained by concatenation from B and C - requires the concatenation of another sign D for the sentence to be grammatical.

Negation is a typical example. The negative particle *ne* requires the presence of either *pas* or a negative constituent. In certain cases, this must be introduced after the concatenation of *ne* :

(18) (a) *ne regarde*
(b) *Personne*_____
(c) _____ *Marie*
(d) * Jean _____

In FG, the same feature percolation mechanism accounts for both local and non-adjacent linearity phenomena. In the latter case, the mechanism interacts with the modifier valency. This cannot be erased if conditions related to non-adjacent linearity phenomena are not satisfied, so that the derivation is blocked. Thus, (18d) is not specified as grammatical, whereas (19) is

(19) *Jean ne regarde Marie dans aucune rue.*

(h) In FG, there is no special rule, or domain in the sign (such as in gap threading) to account for unbounded dependencies. Strictly, nothing more is added to the sentence grammar than embedding verbs and the *que* complementizer.

(i) Methodologically, the basic FG assumptions are :

(I) The single entry requirement :

- Given two grammars G1 and G2 satisfying the same descriptive adequacy conditions, G1 is more highly valued than G2 if G1 satisfies the single entry requirement.

- A grammar G satisfies the single entry requirement if there are no two entries in G with identical phonological and semantical representations.

(II) Grammars must account for idiolectal variation

We claim that (I) is a requirement derived not from "elegancy", but from insight and efficiency : spurious lexical ambiguities increase storage space and lead at parsing time to a proliferation of spurious edges and subparses affecting parsing efficiency.

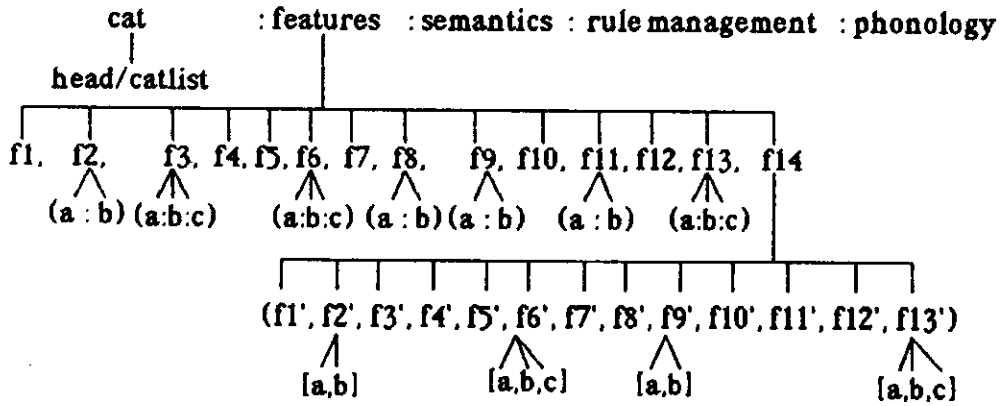
From (II), we derived the requirement that a particular grammar must not favour one of several related idiolects without being able to accommodate with only minor changes slightly different data.

(j) Empirically, we affirm that FG accounts for the core French linearity phenomena, including unbounded dependencies originating in embedded finite clauses, while satisfying with (nearly) no exceptions the methodological assumptions of (i).

2 - The grammar

2.1 The FG sign is :

(20)



The **semantics** and **phonology** domain work exactly as in standard UCG. The same is nearly true for the **cat** domain : the only difference is that in FG there are no features associated with the **head**. These are independently accessible and grouped in the **features** domain. The diagram in (20) presents only their syntax. Their labels, values and function are presented in §3. We return to the **rule management** domain in the comments on unary rules in §2.2.

2.2 FG has four rules :

Forward Application Backward Application	Concatenation Rules
Deletion Permutation	Unary Rules

FA & BA

The rules are :

```
-------------------------------------------------------
FA
-------------------------------------------------------
>F'

>f' =>
CA:[ClA,(AA:PA),InvA,BiA,BnA,(StA:NcA:QcA),Cl1,ImB,(AA:PA),InvA,BiA,
    BnA,(StA:NcA:QcA),_]
   :SA:(Op:Pe):['>f',W1,W2] -->

  (CA/ (CV:[ImV,(A:P),InvV,BiV,BnV,(StV:NcV:QcV),Cl1,_,_,_,_,_,_,
     (Im:[AA,PA]:InvA:BiA:BnA:[StA,NcA,QcA]:ClA:_:_:_:_:_:_)]
    :SV:(Op:Pe):W2))
  :_:SA:_:W1,

  CV:[ImV,(A:P),InvV,BiV,BnV,(StV:NcV:QcV),Cl1,ImB,_,_,_,_,_,_]
    :SV:(Op:Pe):W2.


-------------------------------------------------------
BA
-------------------------------------------------------
<B

'<b' =>
CA:[ImA,(AB:PB),InvB,BiB,BnB,(StB:NcB:QcB),Cl1,ClB,(AB:PB),InvB,
    BiB,BnB,(StB:NcB:QcB),_]
   :SA:(Op:Pe):['<b',W1,W2] -->

  CV:[ImA,_,_,_,_,_,_,Cl1,ImV,(A:P),InvV,BiV,BnV,(StV:NcV:QcV),_]
    :SV:(Op:Pe):W1,

  (CA/ (CV:[_,_,_,_,_,_,_,Cl1,ImV,(A:P),InvV,BiV,BnV,(StV:NcV:QcV),
    (_:_:_:_:_:_:_:ClB:Im:[AB,PB]:InvB:BiB:BnB:[StB,NcB,QcB])]
    :SV:(Op:Pe):W1))
  :_:SA:_:W2.
```

FA and BA function exactly as in standard UCG as regards the **cat**, **semantics** and **phonology** domains.

The **rule management** (= **rm**) domain of the resulting sign is specified by the unification of the rm domain of the active sign with the rm domain of the argument.

In the **features** (= **f**) domain, it must be noticed that FA is not sensitive to all features from the functor or from the argument. The lack of sensitivity of FA to features is indicated in (2a).

(21a) FA ignores the following features :

f8 to f13 f8' to f13'	in the active sign of the functor
f9 to f14	in the argument

We shall show below (§3) how this selective lack of sensitivity allows to specify the different effects of linear ordering inasmuch as they are contextually dependent on left (FA) or right (BA) position in relation to the verb or noun.

It must be noticed also that the **f** domain of the resulting sign (= Rs) is partially specified by features of the active sign (= As) and partially by features of the argument (= Arg). The correspondences are summarised in (21b) where (a) indicates the features of the result sign of FA and (b) their origin.

(21b)

(a) Rs	f7'	f2'	f3'	f4'	f5'	f6'	f7	f8	f2'	f3'	f4'	f5'	f6'
(b) As							f7						
		f2'	f3'	f4'	f5'	f6'	f7'						
Arg							f7	f8					

From this syntax of feature distribution, it is possible to infer the role of f14 : it introduces a doubling of the f domain f1 to f13. (21b) shows that most of the Rs features come from the As primed f, i.e., from slots dominated by f14. In this way, it is possible to percolate selectively the features for each active sign of a functor which has more than one (for example, determiners or prepositions).

Symmetrical comments apply to BA. The substantive effects obtained by this syntax of features will be presented in detail in §3.

Deletion rule

The deletion rule is :

```
-----------------------------------------------------
Deletion
-----------------------------------------------------

'e' =>
C:[*4,((*1):A),Inv,Bi,Bn1,*2,verbe|V]
  :SA:(op:Pe):['e',W] -->

 C/(np:[_,_,_,_,_,_,_,_,(Bi:A),Bn,_,_,_,_]:(_:unknown:_):(op:_):_)
    :[4*(~(comp or vi)),((1*(fin or imp or inf)):A),Inv,Bi,Bn1,2*(~(pa):
    Bn:Qc),verbe|V]
 :SA:(_:Pe):W.
```

Basically, the rule deletes np valencies of verbal signs and introduces the 'unknown' constant in InL semantics ; i.e. the traditional functions of the deletion rule of standard UCG are assured by the FG deletion rule. According to the rule the simplified InL translation for (22a) is (22b)

(22) (a) Jean a présenté Marie
(b) [I] (présenter [I, jean, marie, unknown])

Notice that 'unknown', in the input to the rule, is placed in the predicate slot of the semantics domain of the valency sign (i.e., the sign whose cat is 'np'). This modification allows considerable generalisation of the functions of the rule.

Doubling (optional or not) is a systematic relation in Romance languages in general and in French in particular :

(23a) (a) (Jean)$_i$ aime-t-il$_i$ Marie
(b) Ils se$_i$ détestent (les uns les autres)$_i$
(c) Ils se$_i$ donnent des cadeaux (les uns aux autres)$_i$
(d) Jean les$_i$ regarde (tous)$_i$

Furthermore, the modifier valency in most verbs may or may not be consumed :

(23b) (a) *Jean regarde Marie*
(se/(np/[mod,...]:...)/...fin...]:...)

(b) *Jean regarde Marie dans la rue*
(se:[...fin...]:...)

The 'unknown' constant must not be transmitted to the InL semantics while erasing the optional doubled constituants (parenthetically noted in (23a)) or the modifier valency in (23b).

The requirement of the selective transmission of 'unknown' into InL is conjointly satisfied in FG by the syntax of the semantics domain of valencies in verbal signs (cf. (24(a)-(d)) and of valencies in active signs (cf. 24(d)and (e))) and in the input to the deletion rule (repeated in (18)) :

(24) Type of valency	syntax of the semantics domain	Recall of InL
(a) np optional in verb.lex entries	(X : X : _)	(pred[...,X,...])
(b) np optional in verb signs introduced by doubling	(X : _ : _)	(c(X),pred[...,X,...])
(c) np not optional in verb.lex entries	(X : _ : _)	(pred[...,X,...])
(d) np mod (optional or not)	(I : _ : _)	(pred[I,...])
(e) np in the active sign e.g. 'marie'	(marie : _ : _)	

(25) Deletion rule (_ : unknown : _)

The deletion rule in (25) conjointly with (24a) assures the effects of (22) ; conjointly with (24b), the results of (23a) ; conjointly with (24d), the results of (23b). (25) does not apply to (24c), the valency being not deletable.

The deletion rule erases only valency signs (their Cat is 'np'). The valency must be deletable. Besides these conditions, expressed in the Cat and in the Mr domains of the valency, respectively, features introduce other deletability conditions ; (26) and (27) spell them.

(26)

	f domain of the verbal sign	effect :
(a)	f1	No deletion is possible in signs with a complementizer or a comma to the left.
(b)	(f2a:...)	Only verbal signs which are finite, or imperative or infinitives are subject to deletion.
(c)	(f6a:...:...)	No verbal sign which has incorporated the *pas* particle but which has no *ne* particle is subject to deletion (cf.§4.2)
(d)	f7	Only verbal signs are subject to deletion.

(27)

	f in the f domain		The requirement of unification of the two features accounts for adequacy related to :
	of the verbal sign	of the valency	
(a)	(...:f2b)	(...:f9b)	auxiliaries (cf. §4.1 & 4.3.3)
(b)	f4	(f9a:...)	inversion 2 (cf. §4.4)
(c)	(...:f6b:...)	f10	negation (cf. §4.2 & 4.5)

References incorporated in (26) and (27) indicate the particular construction in which blocking obtains. Conditions in (26) are straightforward. Conditions in (27) introduce the blocking power of the modifier valency.

The general pattern of the blocking procedure is clear. Only the np modifiers valency has values instantiated in f9a, f9b and f10. If non-adjacent linearity conditions related to auxiliaries (including reflexives), to inversion 2 and to negation (including clitics with imperative and subjonctive induction) are satisfied, the required conditions on unification between features in the valency and in the verbal sign will be satisfied, and deletion of the modifier is possible. Otherwise, the modifier valency is not deletable, and the sign, not being in the set defined by (28), is not a grammatical one :

(28) se:[...:(fin:_):...]:_:_:_

Besides deleting the verbal valency and introducing the 'unknown' constant, the deletion rule also introduces the 'op' value in the mr domain of the output sign. The reasons for doing so will be given while presenting the analysis of negation (cf. §4.2).

Permutation rule

The permutation rule is :

```
-----------------------------------------------------
Permutation
-----------------------------------------------------

'pb'=>
C1/(C2:[*2|V2Y]:SY:(nop:p):FY)
 /(np:[*1|V2X]:SX:(Op:(*3)):FX)
:[*4,T2,T3,T4,T5,T6,verbe|T]
:S:(Ope:p):['pb',W] -->

C1/(np:[1*(mod or obj or dat or cons)|V2X]:SX:(Op:(3*(~(p)))):FX)
 /(C2:[2*(~(nom or cons))|V2Y]:SY:(_:_):FY)
:[4*(~(comp)),T2,T3,T4,T5,T6,verbe|T]
:S:(Ope:_):W.
```

Under certain conditions, the permutation rule inverts the first two valencies of a Catlist and modifies values in the Rm domain of permutated valencies.

No condition must be fulfilled by the fronted valency in the Cat or the Rm domains. The penultimate valency must be an 'np'. Its Rm domain requires that it is not an already permutated valency. The other conditions on the input to the rule are expressed by features. They are resumed in (29)

(29)

f	in the f domain of the	effect
1	fronted valency	The fronted valency is neither 'cons' (cf. 4.3) nor nominative
1	penultimate valency	The penultimate valency is any 'np' which is not a nominative
7	sign	Only verbal signs are subject to permutation
1	sign	There is no complementizer at the front of the sign

Besides the inversion of the two fronted valencies in the Catlist of a verbal sign, the permutation rule modifies values in the Rm domain of the valency displaced to the penult position to the effect that the permutated valency is marked as non deletable and non permutable.

3 - The flow of information

In this section the FG flow of information between concatenating signs is presented. The point of reference being UCG, we present first (3.1) the four basic operations which organise the standard flow of information in UCG. Even though FG adds no new operation to the ones used by standard UCG, its formal peculiarities are recalled and motivated in §3.2. The effective distribution of information in the domains of FG is presented in §3.2.1. §3.3 enumerates the underlying variables from which word ordering effects are derived. §3.4 describes the substantive information encoded by features and relates it to the variables presented in §3.3. The two next sections illustrate the way in which FG flow of information allows first to cover order phenomena without resorting to order values (cf. §3.5) and second, to account for non adjacent linearity phenomena (cf. §3.6). The last section (§3.7) explains the general

principles underlying the codification of information in lexical entries ; it is founded on the distinction between invariant and contextual information.

3.1 UCG flow of information

In (3.1) are resumed three of the four basic operations which can be achieved by the flow of information mechanism provided by the functional application rules in standard UCG. The characterisation of each operation refers to (30), where the way the mechanism work is presented abstractly ; in (30) and (32), "h, i, j, k" represent terminal slots in DAG paths.

(30)

		Functor				
Result sign	⇒	Rest of the functor	/	Active sign	,	Argument
X	⇒	X	/	Y	,	Y
..., k ,...		..., h, ...		..., i, ...		..., j ,...

(31)

		Operation :
(I)	v(i) =u= v(j)	Verification
(II)	v(j) =u= v(i) =u= v(h) =u= v(k)	Percolation
(III)	v(j) =u= v(i) ≠ v(h) =u= v(k)	Modification

=u= : unifies ≠ : different v : value

The **verification** operation (I) allows verification that some condition is fulfilled ; agreement is a classical example.

The **percolation** operation (II) allows transmission to the result sign of information which was already present in the argument. Example : morphological characteristics of a verbal sign which are transmitted via the functor to the result sign.

The **modification** operation (III) allows alteration of an already existent information. Exemple : when a participle verb sign concatenates with an auxiliary, the resulting sign becomes a finite verb sign.

In addition to the three preceding operations, standard UCG can also perform **pumping** operation(IV). This operation is presented abstractly in (32). Pumping can be at work iff the functor is a raised category and it incorporates a valency, the argument being a sign with a Catlist constituted by valencies (Henceforth we will refer to valencies in the Catlist of arguments as "passive valencies", and to valencies in the active sign of a functor as "active valencies".

(32)

Active sign		Argument	
Rest	Active valency	Sign	Passive valency
..., h, ...	..., i, ...	..., j ,...	..., k, ...

(IV) i =u= k =u= h =u= j Pumping

The example of pumping, in standard UCG, is the treatment of Order. Lexical NPs, unmarked by a preposition, consume objective and nominative valencies. These valencies are introduced in the Catlist with the primitive values 'post' and 'pre', respectively. So the active valency pumps from each valency a value for order which is transmitted by a shared variable to the rest of the active sign ; by rule, this must unify with a designated slot in the argument sign. The essential function of the pumping operation may be resumed as follows : a valency of the argument imposes on the raised functor which consumes it, the way the functor must concatenate with the argument.

3.2 FG peculiarities

FG incorporates operations I to IV of standard UCG and no new operation. Formal differences of FG wrt standard UCG have been already presented in §2 ; they are recalled in (33) :

(33) a Accessibility of features

b Sensitivity of rules to particular features

c Specification of the feature domain of the resulting sign by features from the domain of the active sign.

Accessibility of features (cf. (33a)) derives from the underlying idea that, linguistically, valencies and signs with overt phonologies are different objects. The former -even if syntactically they are signs- are effectively 'empty categories'. They fix relations between syntactic and morphological characteristics of a given constituent and a particular argument in the argumental list associated with a predicate. (This one, in the InL Semantics, is, with no escape, a real list : order between arguments is significant). With the accessibility of features we want to express the idea that a predicate sign (for example, a verb, an adjective or a noun) sometimes behaves independently of the valencies with which it is associated. For example a verbal sign with clause negation has a specific syntactic behaviour which does not depend on the number or type of valencies it conveyes.

FA and BA are sensitive to different sets of features (cf. (33b)). This express a basic linguistic asymmmetry : constituents concatenating to the left of the verb behave linguistically in a different manner than when concatenating to the right. For example, a wh-constituent may be placed to the left of a verb with clitic *t-il* but never to its right :

(34)(a) Quel livre aime-t-il ?
(b) * Aime-t-il quel livre ?

The feature domain of the result sign is specified not by features in the feature domain of the rest sign of the functor, but (mostly) by features in the active sign (cf. (33c)). The linguistic justification of this innovation lies in functors with more than one active sign (articles and prepositions). If a functor such as in

(35) C/...[F1(F1')].../...[F2(F2')].../.../...[Fn(Fn')]...

presents several active signs, the particular features of each result sign are differently specified for each concatenation : they are spelled in (35) by primed numbers. For example, assuming than an article is (schematically) an *C/(C/np)/n* this makes it possible to associate particular features to the resulting sign *art+n(C/(C/np))* and different ones to *verb+NPsign (se/np...)*.

3.2.1 The distribution of information

The non-identical distribution of information in the f domains of signs and valencies is another peculiarity of FG wrt standard UCG. But no new flow of information operation is added and the basic formalism is not changed in any way.

FG - as standard UCG - is a term unification based formalism. This means that the label of each feature is the slot itself in which particular values can be encoded.

Because no rule requires the unification of valencies - with no overt phonologies - with ordinary signs, even if the syntax of features is in the two cases the same one, the distribution of specific feature values can be different in the feature domain of valencies and in the feature domain of signs with overt phonologies. For example, the slot n°3 can encode information related to agreement in valencies and to inversion in signs. So we can distinguish between "feature domain in valencies" and "feature domain in signs", the latter being signs with overt phonologies. The distribution of information in the feature domain in signs and valencies is presented in (36) and (37) respectively.

(36) Distribution of information in the feature domain of signs

Sensitivity to	Slot	Label	Memonics for	Information related to
FA	1	ImA	Immediate by A	Class of the last sign concatenated to the left
	2	(VfA:AuxA)	(Verb flexion by A: Auxiliary by A)	Morphology of verb and class of auxiliary
	3	InvA	Inversion by A	Type of inversion
	4	BiA	Interrogative blocking by A	Blocking device for Inversion2
	5	BnA	Negative blocking by A	Blocking device for negation
	6	(StA:NcA: QcA)	(Sentence type by A : Negative Const. by A : Question Const. by A)	Type of sentence ; blocking device for negation
BA	7	Cl	Class	Morphological class of a sign
	8	ImB	Immediate by B	Class of the last sign concanated to the right
	9	(VfB:AuxB)	(Verb flexion by B : Auxiliary by B)	cf. 2
	10	InvB	Inversion by B	cf. 3
	11	BiB	Interrogative blocking by B	cf. 4
	12	BnB	Negative blocking by B	cf. 5
	13	(StB:NcB: QcB)	(Sentence type by B : Negative Const. by B : Question Const. by B)	cf. 6

In the f domain of an active sign, f14 dominates f1' to f13' (cf. 2.1) where the distribution of information is :

(36)	Slot	Label
	1', 8'	–
	7'	Class
	2'-6', 9'-13'	Corresponding labels in 2-6, 9-13

(37) Distribution of information in the feature domain of valencies

Slot	Label	Memonics for	Information related to
1	Cas	Case	Valency function
2	Cl	Class	Class required on the functor
3	(G:N:P)	(Gender : Number : Person)	Gender, Number and Person agreement
4	ImA	Immediate by A	Requirements on Immediate Information by FA (XP lex)
5	ImB	Immediate by B	Requirements on Immediate Information by BA (XP lex)
6	ImB	Immediate by B	Requirements on Immediate Information by BA (wh XP)
7	Bi	Blocking of interrogatives	Blocking device for Inversion 2
8	(St:Inv)	(Standard : Inversion)	Type of inversion
9	(Int:Aux)	(Interrogative : auxiliary)	Blocking devices for interrogative and auxiliary
10	Bn	Blocking negatives	Blocking devices for negative
11	(Na:Nb)	(Negative clitics by A : negative clitics by B)	Blocking devices for clitics in imperatives
12	ImA	Immediate by A	Requirements on Immediate Information by FA (XP-lexne)
13	ImA	Immediate by A	Requirements on Immediate Information by FA (wh-XP)
14	_		

XP : NP or PP

3.3 Underlying variables ruling word ordering

As was said in §1(d) no primitive value for order is associated with each valency. The placement of a constituent to the left or the right of the verb follows from four other pieces of information.

Suppose, for example, that we have the signs in (38)

(38)a lui donne-t-il

b quel livre

c le livre

d le (clitic)

and to each of them the following information is associated

(39)a-1 The last sign concatenated to the left is *lui*
The last sign concatenated to the right is *t-il*

a-2 It is a verbal form which
- is finite
- is an Inv-1

a-3 It's obj valency has not yet been consumed

b-1 It is a NP which can consume a np obj

b-2 It is a wh constituent

c-1 It is a NP which can consume a np obj

c-2 It is a lex constituent

d-1 It is a NP which can consume a np obj

d-2 It is a clitic

From (39) it is possible to calculate

(40)a (38b) must be placed to the left of (38a)

b (38c) must be placed to the right of (38a)

c (38c) must be placed to the left of (38a)

Suppose now that we have (41) instead of (38a). The information in (39) from a-3 to d-2 is still valid. Information (a-1') and (a-2') in (42) substitutes for the corresponding ones is in (39).

(41) *donne lui*

(42)a-1' The last sign concatenated to the right is *lui*
No sign has been concatenated to the left

a-2' It is a verbal form which is imperative

From (39)a-3 to d-2 and (42) it is possible to calculate, in relation to (41) :

(43)a (38b) cannot be concatenated

b (38c) must be concatenated to the right

c (38d) cannot be concatenated

The basic assumption of FG is that the rules leading to the (very simple) calculations of (40) and (43) and the information on which they rely can be encoded in an UCG grammar. Observe that in the information to which these rules apply, nothing is said about some primitive value for order associated either with the valency of the verb sign or with the constituent which consumes this valency : it is just not true that clitic *le*, per se, goes to the right or the left of the verb, it is just not

true that the obj valency is, per se, *pre* or *post*. In all cases, it is an interlocking set of factors which determines where it is possible to put something.

It was possible to detect five underlying variables from which all effects of linear ordering are deductible in the intricate pattern of written French (which is not just French in written form but a far more complicated object). These variables are :

(44)(a) Asymmetry to the left and the right of the verb
(b) Immediate information
(c) Morphological class
(d) Verb form
(e) Case

(44a) is expressed by the selective sensitivity of FA and BA rules to specified features ; cf. § 2 and 3.2 above. In the preceding section § 3.2.1 the distribution of information in the f domain was presented. In the subsequent section § 3.4, the mapping between feature information and the underlying variables defined in (44b) to (44e) is explained.

3.4 Substantive information encoded by features and underlying word order variables

In §3.2.1 the distribution of information in the f domains of FG signs was presented. If we refer to (36) and (37) and disregard the differences introduced by sensitivity to rules (i.e., the 'A' and 'B' suffixes), and if we group together labels related to blocking devices, the union of labels in (36) and (37) is

(45)a Immediate
b Class
c Sentence type
Negative constituent
Question constituent
Inversion
d Verb flexion
Auxiliary
e Case
f Gender, Number and Person agreement
g Blocking devices
- Auxiliary
- Negative
- Interrogative

We disregard here (45g). Non adjacent linearity phenomena (cf. §1(g)) are presented in §4.1, 4.2 and 4.4 and it is in relation to them that (45g) is introduced. In the rest of this section, the substantive linguistic information related to (45a) to (45f) is specified and related to the underlying variables (44b) to (44e).

Immediate information (cf.(45a)), which is crucially sensitive to FA and BA, encodes the morphological class of the last concatenated constituent to the right and to the left. It is one of the underlying variables of linear ordering (cf.(44b)). The syntactic mechanism for immediate information was introduced while presenting the concatenation rules (cf. §2). The head of each of the two basic constituents of the sentence (NP's and VP) are lexically introduced with an 'i' (= initial) value for immediate information. So the derivations in (46) can be obtained :

(46)(a) *Jean regarde Marie*

	f1		f8
regarde	i	...	i
Jean _____	lex	...	i
_____ Marie	lex	...	lex

(b) *Jean regarde qui*

regarde	i	...	i
Jean _____	lex	...	i
_____ qui	lex	...	wh

Wrt a large class of phenomena, the class of the last concatenated sign introduces restrictions on the concatenation of the next sign. Clitics are typical examples (cf. §4.1). Besides clitics, we will see in §4 that it is possible to deal with a wide range of phenomena (noticeably : interrogatives, unbounded dependencies, relative clause, modifier placement) if the following generalisation is introduced in the grammar.

(47) If a wh-constituent has been concatenated to the left of a clause, no other constituents can be concatenated to the left of the clause.

Class information (cf. (45b)) expresses the morphological class of a constituent : *verbe*, *lex*(-lexical), *lexne*(-negative lexical), *wh* are typical values of this class. Class information expresses the morphological class variable underlying word order (cf. (44c)).

Information expressed by (45c) concern sentence-type : affirmative, negative and interrogative sentences, with their interlocking characteristics. The information in (45c) is incorporated into FG mainly to cover linear ordering phenomena (they

concern the verb form variable underlying word order), but it is interesting to point out that they are also needed to account for question-answer adequacy and coordination ; cf. (48) and (49), respectively.

(48)(a) Regarde-t-il Marie ?
Oui
* Si

(b) Ne regarde-t-il pas Marie ?
Si
* Oui

(49)(a) Analyse-t-il les problèmes correctement et trouve-t-il les bonnes solutions ?
* Analyse-t-il les problèmes correctement et ne trouve-t-il pas les bonnes solutions

(b) Où est allé Jean et a qui a parlé Marie ?
* Où est allé Jean et Marie parle-t-elle ?

The informations in (45c) is encoded by f 3 (&.10) & 6 (&.13) in the f domain of signs. (50) - that incorporates also f1 - illustrates typical examples which can be specified by these features :

(50)

	f domain in the sign				
	f1	f3	f6		
			(a:	b:	c:)
Jean aime Marie		st	af	i	i
Jean aime qui		st			wh
Qui Jean aime	wh	st			
Qui Jean aime-t-il	wh	inv1			
Jean n'aime pas Marie		st	ne	pa	
Personne n'aime Marie		st	ne (i or neg)		
Jean n'aime pas qui		st	ne	pa	wh
Quel livre aime Jean	wh	inv2			
Quel livre n'aime pas Jean	wh	inv2	ne	pa	
Jean aime-t-il Marie		inv1			
Quel livre aime-t-il	wh	inv1			
Sans doute aime-t-il Marie		inv1			m
Ne regarde-t-il pas Marie		inv1	ne	pa	

3.5 French order without order values

The flow of information presented in the preceding sections allows us to account for linear ordering effects without resorting to primitive values of order associated with valencies. An example is presented here ; the application of the system to the complex pattern of written French is developed in §4.

Suppose we want to express in the grammar the statements expressed in (51), illustrated by examples in (52).

(51)a Lexical NP, as subjects, precede the verb.

b Lexical NP, as objects, may not precede the verb.

c Lexical NP, as objects, may follow the verb.

d wh-NP, as subjects, may precede the verb.

e wh-NP, as subjects, may not follow the verb.

f wh-NP, as objects, may precede the verb.

g wh-NP, as objects, may follow the verb,
but in this case, no inv-1 is admitted.

(52)a *Jean* aime Marie.

b * *Marie* Jean aime.
* Jean *Marie* aime.

c Jean aime *Marie*.

d *Qui* aime Marie ?

e * Les aime *qui* ?
* Marie aime *qui* (nom) ?

f Qui Marie aime ?

g Marie aime qui ?
* aime qui ?

Information in (45d), conjointly with that already presented ones in (45c), completes the verb form variable underlying linear ordering. **Verb flexion** expresses possible verb inflexions : *fin* (finite), *inf* (infinite), *imp* (imperative), *p* (participle) are typical values of this label. **Auxiliary** encodes the two French auxiliaries *av*('avoir') and *e*('être').

Case information (cf. (45e)) encodes grammatical case e.g. *nom* (nominative), *obj* (object) and *dat* (dative). The case variable (cf. (44e)) underlying linear ordering is expressed by case information.

Agreement informations (cf. (45f)) concerns the traditional Gender, Number and Person relations of agreement, with their traditional values ; i.e. m(masculin), f(feminin) ; s(singular) ; pl(plural) ; p(person)1, p2, p3. Agreement information is not related to any underlying variable of word order.

(51) summarises the mapping between underlying variables of word order and feature slots

(51)

Underlying variables	f domain	
	sign	valency
(I) Left and right asymmetry		
FA active sign	8-13	
argument	9-13	
BA active sign	1-6	
argument	2-6, 14	
(II) Immediate information		4, 5, 6, 12, 13
FA active sign	1,7'	
argument	1,8	
BA active sign	8,7'	
argument	8,1	
(III) Morphological class	7,7'	2
(IV) Verb form	2, 3, 6 9, 10, 13	
(V) Case		1

(53) Summarises the elements in FG accounting for (51)

(53)

	f domain											
	valencies							sign				
	1	...	4	5	6	...	13	1	...	7	8	9
(a) passive nom val	nom		~wh	i	k		~wh					
(b) passive obj val	obj		k	_	_		~wh					
(c) active val in the active sign of lex-NP	nom or obj		ImA	ImB	_		_					
(d) active val in the active sign of wh-NP	nom or obj		_	_	ImB		ImA					
(e) active sign of lex-NP								ImA	...	verbe	ImB	V
(f) active sign of wh-NP								ImA	...	verbe	ImB	~inv1
(g) verbal argument signs												
(g-1) aime								i	...	verbe	i	V
(g-2) Jean aime								lex		verbe	i	V
(g-3) aime-t-il								i		verbe	il	inv1
(h) Unification sensitivity of rules (verification)												
(h-1) FA								_____		_____/		
(h-2) BA										_____		_____/

The verification operations of (53) apply trivially : slots 1 of valencies and slots 7 and 9 in the active signs of NP's and verbal signs.

The other verification operations of (53) interact with pumping.

Consider (51a) and (51b). Thanks to f4 in valencies, the *ImA* variable in (53c) pumps the *~wh* value in (53a) and the NP entry transmits it by a shared variable to f1 in the sign. Thus, we have the typical pattern of pumping : the valency encodes a requirement which must be satisfied by the functor which consumes it while concatenating whith the sign conveying the valency. Because the verbal sign is (g-1), (51a) is satisfied and (52a) is obtained.

Consider now (51b). The ImA variable in f4 (valency), while it instantiates with (53b), pumps 'k' (=kaput), an impossible value to unificate because no sign is of the 'kaput' class. Thus (51b) is satisfied and the grammar specifies no derivation for (52b).

It is possible to verify easily that verification and pumping in (53) account for all statements in (51). In all cases the sensitivity of rules is crucial : for example, a wh-NP, while concatenating by FA, pumps also the 'k' value, but the FA rule does not look it while verifying the conditions of concatenation.

Observe that (53) allows the specification of (54) :

(54) aime Jean

(54) can be completed into a grammatical structure iff a wh constituent is concatenated to its left. This belong to the non adjacent linearity pattern, which we deal with in the subsequent paragraph.

3.6 Non adjacent linearity phenomena

Within the non adjacent pattern of linearity, to assure the grammaticality of a particular sign A, it is necessary to concatenate another sign B in a subsequent stage of the derivation in specified conditions, these conditions being determined by signs already concatenated into A, or by A itself if A is a lexical entry. Precedent example (54) illustrates this pattern. The unachieved derivation in (54) can be completed by the grammatical possibilites in (56) but by no possibility in (56).

(55) Quelle revue regarde Jean ?
Où la regarde Jean ?

(56) * regarde Jean quelle revue.
* la regarde Jean.
* la regarde Jean à Paris.
* regarde Jean la revue où

Non adjacent linearity is a real challenge for grammars which are :

(57)(a) monostratal, i.e., in which no more than one syntactic level is admitted and in which no filtering of the syntax output by the semantics is allowed.

(b) build around the restriction of adjacency ; i.e. in which the concatenation of non adjacent signs is impossible.

(c) constrained by the single entry requirement.

Observe that problems arising from non adjacent linearity can be solved trivialy in grammars not committed to satisfy (57c).

In the simple precedent examples of (55) and (56), it is sufficient to incorporate to the lexicon several lexical entries for each verb, expressing, all of them, the same semantics and the same case requirements on valencies, while introducing specific requirements related to order and morphological constituency on specific valencies.

In other cases, the resort to the lexical ambiguity expedient seems more difficult. The data in (58) suggest strongly the descriptive generalisations in (59) :

(58)a Personne ne viendra ce soir.

b Jean ordonne à Marie de ne pas partir.

c Jean ne viendra pas ce soir.

d * Personne viendra ce soir.

e * Jean viendra pas ce soir.

(59)(a) pas ➡ ne

(b) personne ➡ ne

(c) ne ➡ (pas V personne)

We leave aside here (59c) ; (cf. 4.2). It is tempting to translate the (60a) general pattern, underlying (59a) and (59b), into (60b) :

(60)(a) a ➡ b

(b) *b* concatenates before *a* and introduces a condition which must be fulfilled by the concatenation of *a*.

But adjacency (cf. (57b)) together with (58a) and (58b) compells us to recognise that the analysis of (60b) is impossible within a grammar satisfying (57) and very costly in a grammar not satisfying (57c). Negation being, in the above examples, a local phenomena, it is not literally impossible to fabricate enough lexical entries for *ne, pas* and the verbal lexical entries in a way to assure the coverage of (58).

But FG does not allow the proliferation of lexical ambiguity, and by this token, the blocking mechanism is justified.

The blocking mechanism express (60a) by (61)

(61) *a* concatenates before *b* and introduces conditions requiring the concatenation of *b*; if these conditions are not satisfied, *a* is ungrammatical.

A blocking mechanism such as (61) consists of two parts : the introduction of a constraint into the derivation and the verification that the constraint has been satisfied.

The FG blocking mechanism consists of :

(62)(a) The flow of information mechanism.

(b) The lexical sub-categorisation of each verb for a np modifier valency.

(c) The rule of deletion.

(d) Ad-hoc slots
in the f domain of signs : f4(&11), 5(&12)
in the f domain of valencies : f7, 9, 10, 11.

(e) Ad-hoc requirements in the deletion rule (cf. (27)).

(62a) to (62c) have independent - and so we think - strong motivation from other parts of the grammar. Some of this motivation has already been presented : cf. in §3 the precedent paragraphs and in §2.2 the presentation of the deletion rule. Concerns on (62b) will be presented in §4.6. (62d) and (62e) represent the specific cost of the blocking mechanism. The flow of information incorporated to the concatenational rules plus (62d) implement its first part, i.e., the introduction of a constraint into the derivation ; pumping and sensitiveness of rules are crucially used. (62e) assure the verification of constraints introduced in the derivation.

Examples in (55) and (56) are covered by the FG elements in (63).

(63)

	f domain											
	valencies					sign						
	...	7	...	9a	...	...	3	3'	...	10	10'	...
(a) passiv nom val		bi		–								
(b) passiv mod val		–		~bi								
(c) active val in the active sign of lex NP		BiB		–								
(d) active val in the active sign of wh NP		–		–								
(e) active sign of lex NP							BiA	BiA		BiA	BiB	
(f) active sign of wh NP							Bi	BiA		BiB	BiB	
(g) Verification requested				Bi			Bi					

The BiB variable of (63c) pumps the *bi* value of (63a), which is transmitted to f10' in the sign, and, by BA, to f3 and 10 in the result sign. In this way, iff a NP lex subject concatenates to the right, the result verbal sign incorporates the *bi* value. The first part of the blocking mechanism is thus mainly assured by pumping and the sensitiviy of rules (recall that FA is not sensitive to f10').

The grammatical sign belongs to the class in (28). This requires the deletion of the np mod valency. But, thanks to (63b) and (63g), which implement the verification mechanism of the blocking device, the deletion is impossible unless *bi* is erased from f3.

Wh-constituents are the only functor exhibiting the pattern in (63f) : when FA applies (f3 and 3'), thanks to a modification operation, the *bi* value is erased, the np mod can be erased, and the derivation becomes, wrt inversion2, grammatical. In this way, iff a wh constituent concatenates to the left, a verbal sign with its NP lex subject to the right is grammatical.

4. The coverage

One of the central semantic notions in InL –at least as we understand it– is that of a predicate associated with a significantly ordered argument list. In actual UCG grammars, the verb is the only linguistic predicate to which careful attention has been devoted. But there are other linguistic predicates (e.g., adjectives and nouns), which, if some abstraction is admitted, present the same pattern as verbs. In this report, adjectives and nouns are very poorly introduced, the only interesting issue wrt them is the generalisation of the analysis of modifiers (cf. §4.6). So we are left only with verbs, which are chosen as being the pivot of a sentence.

In relation to this pivot, it is advantageous to distinguish a *kernel* and a *periphery*. The kernel is made up by the pivot itself, i.e. an obligatory verb, simple or complex (i.e., an auxiliary plus a verb participle) and, optionally, by clitics and negative particles. Four moods are distinguished : indicative, subjunctive, imperative and infinitive.

The kernel of French sentences are summed up in the following (64) and illustrated in (65).

(64)(a) ... (ne) *(~nomcl)* verb-fl (nomcl) (pas) ...
(b) ... (ne) (~nomcl) aux-1 (nomcl) (pas) (aux-2) verb-pp ...
(c) ... (ne) (pas) *(~nomcl)* verb-inf ...
(d) ... (ne) (pas) *(~nomcl)* aux-inf (aux-2) verb-pp ...
(e) ... (ne) *(~nomcl)* verb-imp (pas) ...
(f) ... verb-imp *(~nomcl)* ...

where

~nomcl :	non nominative clitic sequence
nomcl :	nominative clitic
verb-fl :	inflected non imperative and non infinitive verb
verb-pp :	participle verb form
verb-inf :	infinitive verb form
verb-imp :	inflected imperative verb
aux-1 :	inflected *avoir* ou *être*
aux-2 :	*eu* or été
aux-inf :	infinitive form of *avoir* ou *été*

(65)(a) ... ne le lui donne til pas ...
(b) ... ne le lui a til pas donné ...
... ne lui a til pas été donné ...
... n'est til pas aimé ...

(c) ... ne pas le lui donner ...
... ne pas partir ...

(d) ... ne pas le lui avoir donné ...
... ne pas être parti ...

(e) ... ne le lui donne pas ...

(f) ... donne le lui ...

(64) is nothing more than a first approach which makes it possible to situate problems. It expresses none of the complex implicative relations between constituents (e.g., that *pas* requires *ne* or that a non nominative clitic to the left of an imperative requires *ne*).

Lexematic (=lex), wh and negative lexematic (=lexne) NP's or PP's concatenate to the left and to the right of a kernel ; they are said to be in the periphery.

In the subsequent sections of this repport we present FG coverage. Sections 4.1 to 4.3 are devoted to the kernel (Auxiliaries, Negation and Clitics, respectively), and sections 4.4 to 4.7 to the periphery (Lex, wh and lexne XP placement, Subjunctive induction, Modifiers and Unbounded Dependencies, respectively). The last section, 4.8, offers alternative solutions of precedent analysis motivated by idiolectal variation.

Neither copulatif *être* nor relatives have been incorporated, partially for practical reasons, partially for theoretical ones. Among the latter : adjectives and nouns are predicates which, exactly as verbs, subcategorize for a set (not a list) of valencies. We think that the important underlying and general issue is to understand how sets of valencies associated in the lexicon with different predicates come, in the process of concatenation, to interact and to form new sets. Unbounded dependencies seem to be no more than a particular instance of this general process. In short, to understand copulatif *être* it is necessary to consider adjectives and nouns as predicates associated with a set of valencies, and this is beyond the scope of present FG coverage.

Infinitives are very poorly treated here also. They are only incorporated to complete the presentation of negative particles and auxiliaries. Again, the reasons for so doing are partially practical, partially theoretical. Infinitive sentences may be valencies of adjectives and, as such, cannot be incorporated in the absence of a general treatment of the latter.

With these caveats, we come back to verbal entries, which are the obligatory constituent of the kernel of a French sentence. In all cases, their syntax, f and mr domains are as indicated in the following[1].

(66) syntax : se/Catlist

f : [i, 2, Inv, Bi, Bn, (af:i:i), verbe, i, 10, Inv, Bi, Bn, (af:i:i)_]
1 3 4 5 6 7 8 10 11 12 13

mr : (i:i)

Syntax domain : A common pattern underlies Catlist :

(a) The nom obligatory valency is placed first.

(b) Each particular distinguished valency is situated in a fixed place in all verbal entries (cf. rigid order, §(1e)). They are situated according to their complementary distribution linguistic properties ; i.e., two valencies different wrt their case are placed in the same position iff they never occur in some entry.

(c) Following the last fixed placed valency, all verbal entries incorporate a mod(modifier) valency.

(d) Following the mod valency, verbs with an embedding valency (e.g. *dit*) incorporate a gap valency.

This pattern is resumed and illustrated in the following.

(67)	donne :	np nom	np obj	np dat	np mod	
	dit :	np nom	(se/npX)	np dat	np mod	npX
	présentée (pas) :	np nom	np ag	np dat	np mod	
	parle :	np nom	np cons	np dat	np mod	
	aime :	np nom	np obj	np mod		
	habite :	np nom	np mod			

F domain. Each verbal entry indicates that it is in the i(initial) state for immediate information (f1&8), that it is a verb (f7) and that it is of the af(affirmative) type, while in the initial states for negative and question constituents (f6&11). Entries diverge wrt f2(& 9) slots. They carry information related to verb flexion and auxiliary labels ; we will refer to them in §4.1.1.

Mr domain. The following are FG characteristics which contribute to ensure that all elements of the kernel concatenate before the ones in the periphery.

---

[1] From hereafter, i in a particular slot indicates that the slot is occuped by specific values in particular verbal entries, and "..." will note underspecification of irrelevant information.

(68)(a) Verbal entries are in the initial states of the mr domain ; i.e. this domain is i : i

(b) Concatenational rules require the unification of the mr domains of the active sign and of the argument. This unification specifies the mr domain in the resulting sign (cf.§2.2).

(c) With the unique exception of *ne*, all functors present a variable in the mr domain of their active sign.

(d) The mr domain in the active sign of *ne* is *i : i*.

(e) Unary rules alter the initial constants in the mr domain. After the application of the deletion and permutation rules, the results are (op : $\underline{V}$) and ($\underline{V}$: p), respectively (cf.§2.2), where $\underline{V}$ notes the value transmitted by the percolation variable of the rule.

The common core of verbal entries is resumed in (66) to (68). All linguistic constructions presented in the following sections are specified in function of it.

4.1 Auxiliaries and verb agreement

Three issues concern auxiliaries and verb forms : agreement, linear and semantic relations. Imperatives admit no auxiliary. There are two auxiliaries in French (*avoir* and *être*), and verbs subcategorize for them.

Agreement. In kernels with simple verb forms, subject and verb agreement is straightforward : It is expressed in (69).

(69) The subject number and person agree with the verb.

In kernels with complex forms, the agreement pattern is more involved.

We subsumed under the label "participle" both passive forms and past participles and we destinguish in French accorded (illustrated in (70 a,b) vs. invariant participles (70c).

(70)(a) Marie est aimée par Pierre.
* Jacques

(b) Quelle revue Marie a regardée.
* Quel livre

(c) Marie a regardé Rose.
Jacques

The generalisations underlying agreement are resumed in the following

(71)(a) Non infinitive auxiliaries number and person agree with the subject.

(b) Accorded participles number and gender agree with the subject if the verb has no object valency, with the object otherwise.

Furthermore, the generalisations in (72) underlies the placement of obj valencies to the left of the verb.

(72)(a) In complex verb forms, obj valencies are placed to the left of the verb iff this is an accorded participle.

(b) An obj valency placed to the left of the verb is a clitic, a wh-NP (or a relative pronoun, not incorporated into FG, and to which we do not refer in the following)

The following generalisations complete the picture. They must be in any case independently expressed in the grammar.

(73) A reflexive is a clitic which

(a) requires *être* in complex verb forms

(b) corefers with the subject and, though not morphologically marked, must gender, person and number agree with it.

(74) Modulo the incorporation of a reflexive form, participles which subcategorize for *avoir* subcategorize for *être*

(74) is illustrated by (75).

(75)(a) Marie a préparé les examens pendant les vacances.
Pierre

(a-1) Marie s'est préparée pendant les vacances.
* Pierre

(a-2) Marie s'est préparé les examens pendant les vacances.
Pierre

(b) Marie a offert un livre à Rose.
Pierre

(b-1) Marie s'est offerte à Jacques.
* Pierre

(b-2) Marie s'est offert un livre
Pierre

Linear relations. It is apparent from (64) that auxiliaries are placed to the left of the verb, and that immediately to the right of the inflected forms of *avoir* and *être* only the nom clitic and *pas* are admitted, in this order[1].

In relation to complex auxiliary forms (i.e. *aux* + (*été* or *eu*)), there are important idiolectal differences. In this section, the largest situation is accounted for, but in §4.8 alternative analyses inhibiting the specification of not unusual forms (noticeably, those in (77d to f)) are presented. So we accept here the constructions which are covered by the generalisations in (76) and (77), illustrated in (78).

(76) *été* and *eu*
(a-1) are placed immediately to the left of the participle
(a-2) require *avoir*
(b-1) *été* requires a participle subcategorizing for *être*
(b-2) *eu* requires a participle subcategorizing for *avoir*

(77) *avoir* admits *été* ou *eu* to its right

(78)(a) a donné
(b) a donnée
(c) a été regardée
(d) a été partie
(e) a eu donné
(f) a eu donnée
(g) s'est donné
(h) s'est donnée
(i) est regardée
(j) est partie
(k) * est été regardée
partie
(l) * est eu donné
(m) * a partie
(n) * a aimée (pas)

Semantic relations. The semantic informations introduced by auxiliaries is treated here in a very embrionic fashion.
If the forms in (79) and (80) are considered, it is possible to state the observations in (81).

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[1] In an extended French grammar, some adverbs and *rien* must also be admitted in this position. They are not incorporated in the present FG version.

(79) Marie est partie
Marie a aimé Jacques
Marie s'est donnée à Jacques
Marie a été aimée par Jacques

(80) Marie est aimée par Jacques
Marie aime Jacques

(81)(a) The temporal coodinate of the speech acts related to (79) and (80) is the present

(b) The verbal event has been accomplished before the temporal coordinate of the speech act.

(c) In (80), the verbal event is being performed at the temporal coordinate of the speech act.

(d) In (79), as a consequence of (a) and (b), the verbal event has been performed before the present.

(e) In (80), as a consequence of (a) and (c), the verbal event is being performed in the present.

The present observations can be generalized. Wrt the forms in (82) and (83) the only new information needed is stated in (84).

(82) Marie était partie
Marie avait aimé Jacques
Marie s'était donnée à Jacques
Marie avait été aimée par Jacques

(83) Marie était aimée par Jacques
Marie aimait Jacques

(84) The temporal coordinate of the speech acts related to (82) and (83) is the past.

From (84) and (81b & c) it is possible to derive the adequate observations related to (82) and (83), i.e., anteriority and simultaneity of verbal events wrt to the past, respectively. More generally, and even if much more sophistication is needed, it is possible to state that finite forms, both simple verbal forms and auxiliaries, introduce the temporal coordinate of the speech act, that non passive participles introduce a relative temporal relation of anteriority wrt the temporal coordinate of the speech act, that simple passive forms introduce no anteriority relation wrt the speech act, which is introduced by *été* in passive complex forms. Within these observations it is

possible to establish straight forward paraphasis temporal relations between active and passive forms.

4.1.1 The elements of the solution

The FG general principle underlying the analysis of auxiliaries is that inflected auxiliaries introduce the inflexion information (finite or infinite) into verbal signs, where by these become suitable for further concatenations : with the exception of nominative clitics and *pas*, no concatenation with a participle can be obtained before the verb has become finite or infinitive. Auxiliaries do not modify substantially the list of valencies : they just introduce agreement into the nominative one. Because this one in FG is the first in the Catlist, agreement relations are expressed in a general form. The number of valencies can vary for different verbs, but all verbs have a nominative one, which is the first. We build on this generalisation so that there is no need to have several auxiliary entries searching in their active sign for the most hidden valency (i.e. the nominative one) in the verbal Catlist. Thus there is no spurious lexical ambiguity in auxiliaries entries.

Furthermore, in FG, there is also one and only one lexical entry for each participial form with identical phonology and semantics ; e.g., all examples in (85a) and (85b) requires only one entry for *donnée* and *offert*, respectively. As we will see below, this is possible thanks to the blocking device introduced in the grammar.

(85)(a) Quelle revue Marie a donnée à Pierre.
[Après] que Marie l'a eu donnée à Pierre ...
Marie s'est donnée à Pierre.

(b) Marie a offert un livre à Marie.
Marie s'est offert un livre.

The grammar does not overgenerate, and, for example, no parse is specified for any of the following examples.

(86) * Marie a donnée quelle revue.
* Quel livre Marie a donnée à Pierre.
* Marie s'est offert un livre.
* Marie s'est donnée à Pierre.

Auxiliaries : the FG elements expressing the precedent analysis of auxiliaries are presented here after.

(87)(a) Auxiliaries are inflected (finite or infinite) or invariant (*en, été*). All auxiliaries are functors on verbal signs, i.e., on participial verbal entries or

on verbal signs already obtained by concatenation (e.g., (*en* or *été*) + *participle*).

They belong to two basic types, *avoir* and *être*.

The syntax domain of auxiliaries is, schematically, as follows :

Inflected : C/(np:[nom... (G : 3b : 3c) ...] ...) / (C/(np : [nom ... (G : 3b : 3c) ...] ...)

Invariant : C/C

(recall that 3b & 3c correspond to number and person values, respectively).

(b) The f domain of the active sign of finite indicative inflected auxiliaries is a follows.

[1, (2a : _) ... verbe, k ... (... : [2'a : 2'b] ... : aux: ...)]
7 8 7'

where i corresponds in actual entries to

f	Recall of f value	avoir	être	eu	été
1	ImA	i *or* il *or* pa	i *or* il *or* aux	i *or* il *or* pa	i *or* il *or* pa *or* pa
2a	verb flexion	p *or* pp	p *or* pe	p	pe
2'a	Verb flexion	fin	fin	pp	pp
2'b	Auxiliary	av	e	–	–

In infinitive forms, 2'a = inf, and in subjunctive finite forms, 2'a = fins.

(87a) is illustrated by some by examples in (84), where F = functor and A = Argument.

(88)(a)

est	regardée
_F_	___A___
_____A_____	

(b)

a	été	regardée
_F_	_F_	___A___
	_____A_____	
_____A_____		

(c)

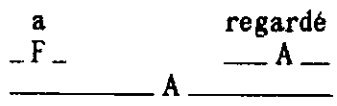
a	eu	regardé
_F_	_F_	___A___
	_____A_____	
_____A_____		

Features in the active sign of auxiliaries (cf. (87b)) account for linear ordering and for the subcategorisation relations between auxiliaries and participles.

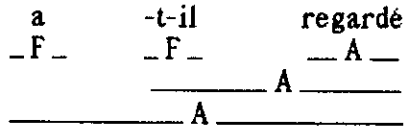
F1 express the class of signs with which an auxiliary can combine immediately to its right. Observe that only *avoir* auxiliaries admit another auxiliary (cf. (78c), (78d), (78c), (78f), (78k) and (78l)), but all of them admit a verbal entry, or a nominative

clitic or the negative paricle *pas* (cf. the *i*, *il* and *pa* values, respectively). Thus we obtain the following examples.

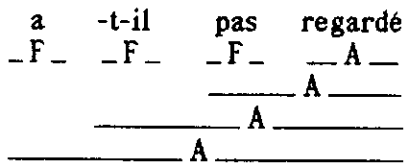
(89)(a)



(b)



(c)



F2a states, wrt verb flexion, the class of verbal signs with which an auxiliary can combine. *Avoir* participles can combine with *p* participles or with complex forms which have already incorporated an auxiliary (cf. (90a)), but not with *pe* participles (cf.(90b)). Instead, *être* auxiliaries combine both with *p* and *pe* participles (cf.(90c)), but not with forms with a previously concatenated auxiliary (cf.(90d)) ; invariant auxiliaries *eu* and *été* combine with *p* and *pe* participles, respectively(cf.(90e)).

(90)(a) a regardé(e)
a eu regardé(e)

(b) * a partie
* a aimée (pas)

(c) est aimée (pas)
est partie
est donnée
est donné

(d) * est été partie
* est eu donné

(e) eu donné
* eu partie
été aimée (pas)

The value *verbe* (f7) of (90b) states that auxiliaries concatenate only with verbal signs, and *k* (f8), that a concatenation by the right is impossible. F2'a states the output value of Verb flexion. When this is *inf* or *fin* , concatenation of the other

constituents of the sentence can proceed. Invariant auxiliaries have behing *pp* . Auxiliaries introduce *aux* (f7' while concatenating by FA).

More interesting for the auxiliary analysis are values introduced in f2'b : each one of the two inflected participles leaves a mark of its concatenation, which will be crucial for the blocking mechanism.

Verbal entries. Entries with syntax *se/Catlist*, i.e. verbal entries (cf. (66)) are simple inflected (finite or infinite) verbal forms, or participles. These are accorded (cf. (78b), (78c), (78d), (78f), (78h), (78i), (78j) or invariant (cf. (78a), (78e), (78g). Accorded ones have (cf. (78b), (78f), (78h), or do not have an obj valency (cf. (78c), (78d).

The distribution of feature information in verbal FG entries is resumed in the following table.

(92)

f	f domain	simple finite forms	participles		
			invariant	accorded	
				with np obj	without npobj
2(9)	sign	(fin;_)	(p:_)	(p:_)	(pe:_)
3	np nom	(G:3b:3c)	(G:N:Pe)	(G:N:Pe)	(3a:3b:Pe)
	np obj	[...,...,...] 3	[...(wh *or* lex *or* lexne, 2 _, k, ..., k, k, _] 3 4 12 13	[...(clit *or* wh *or* refl), 2 (3a:3b:_),...,k,..., 6 ~(wh or vi),_] 13	
9b	np mod	_	av	av	_

The first line of (91) completes, with the specification of f2, the specification of the f domain of verbal entries presented in (66). Agreement relations with the subject are introduced by the second line of (91). In the third line, the f domain of the obj valency states the distribution of obj constituents to the right (invariant participles) or to the left (accorded participles) of the verb forms. The invariant participles require a wh-constituent, or a lexical or negative one (f2), but these must be placed to

the right (cf. *k* in f4, 12 & 13, which prevent concatenation to the left) ; there are no requirements on agreement in f3. There are stated in f3 of the accorded participles which, in f2, ask for a clitic, a reflexive or a wh-constituent, which must be placed to the left (cf. *k* in f6 which forbids the concatenation of a wh-constituent to the right). Generalisations in (71) and (72) are thus expressed in the grammar by the second and third lines of (91). In the fourth line of (91), f9b introduces another important element of the blocking mechanism related to auxiliaries. This will be explained in full after the introduction of reflexive entries.

The analysis of clitics is presented in the next section, but we introduce here reflexive *se's* (obj and dat) inasmuch as they are closely related to auxiliaries and verbal agreement. The syntax domain of their active sign is represented in the following.

(92)(a) C/(np:[obj,refl,(G:N:p3),...]:X:...)/(np:[nom,Cl,(G:N:p3),...]:X:...)

(b) C/(np:[dat,refl,(G:N:p3),...]:X:...)/...(np:[nom,Cl,(G:N:p3),...]:X:...)

The f2 and f2' slots in the f domain of the active sign are represented in (87a) and (87b), respectively.

(93)(a) (1*(inf *or* fin *or* fins):e)

(b) [*1,_]

The shared variables of the nom and obj semantics of (92) account for anaphora relations between reflexives and the subject. Agreement relations are accounted for by the same means. In simple finite forms and in invariant participles, obj and dat valencies have no agreement values ; agreement relations are thus introduced wrt the nominative valency only. In kernels with an accorded participle of a transitive verb, it is the active sign of the obj reflexive (cf. (92a)) that introduce the agreement relations wrt both the obj and nom valencies. So it is possible to specify adequately the examples in the following with only one entry for *donnée*.

(95)(a) Quelle revue Pierre / Marie a donnée à Rose.

(b) Marie s'est donnée à Jacques.

(c) * Pierre s'est donnée à Jacques.

The elements of the blocking device wrt auxiliaries have already been presented : (i) *avoir* and *être* introduce *av* and *e* respectively in f2'b (cf. 87b) ; (ii) in f9b of the mod valency, invariant participles and accorded ones in transitive verbs present *av* (cf. (91)) ; (iii) reflexives require *e* in f2b, with they erase in f2'b (cf. (93)) ; (iv) the deletion rule requires the unification of f2b in the f domain of the verbal sign with f9b in the f domain of the erasable valency (cf. (27)).

The blocking mechanism allows the *être* auxiliaries to concatenate either with *p* or with *pe* participles. In the case of the latter, no particular problem arises. In the forms, derivations such those illustrated in (95) are specified (in brackets, the values for f2) with transitive verbs.

(95) est donné (fin, e)
est donnée (fin, e)

If a reflexive is not incorporated, the deletion rule cannot erase the mod valency and no grammatical derivation is specified. If a reflexive is incorporated, it erases the *e* value and deletion proceeds. In short, the reflexive transformation of generative grammar(s), which expresses basically that reflexive forms are moved to the left of the verb introducing a particular requirement on the auxiliary, is expressed lexically in FG by functional application concatenational rules and with no spurious lexical ambiguity.

Semantic relations sketched in (79) to (84) are expressed in the semantic domains of verb and auxiliary forms resumed in the following.

(96)(a) Finite simple
Present forms : (...[I:pres:[ ], ([I:predicate:[Arglist])])

(b) *p* or *pe*
participles : (...[I:temp:[I,avant], (I:predicate:[Arglist])])

(c) passive : (I:predicate:[Arglist])

(d) present *être* and *avoir*
auxiliaries : (...[:pres:[ ], (I:P:A)])

(e) *été* : (...[I:temp:[I,avant],(I:P:A)])

where *I:P:A* in (d) and (e) unify with the semantics of the participial verbal sign.

This solution does not account for all the syntactic coverage of the preceeding analysis. Most noticeably, *eu + particple* forms receive no adequate description. Neverthless, the analysis points to at seems to be an adequate solution : temporal relative information of complex forms must be incorporated in participles ;

auxiliaries introduce only the temporal coordinate of the speech act. An analysis along this line makes it possible to account for passive forms and *p* and *pe* participle forms with the same *être* auxiliary entry.

4.2. Negation

The following issues are at least involved by negation.

(97)(a) Non adjacent linearity relations between negative elements
(b) Placement of negative particles
(c) Placement of negative constituents
(d) Clitics and negation
(e) Subjunctif induction by negation
(f) Semantic representation

This section will treat only of issues (97a) and (97b).

Several kinds of negative constituents (= neg - XP) must be distinguished to describe their placement in the sentence :

neg - XP (~mod) (e.g., *aucune fille, personne*)

neg - XP (mod) (e.g., *dans aucune ville, nulle-part*)

Neg - XP (~mod) behave, wrt placement, as lex - XP (~mod), so they will be considered in §4.4. Neg - XP (mod), which differ from lex - XP (mod) wrt placement, will be treated in the section on modifiers (4.6). Clitics behave differently in the imperative mood than in the other ones, and negation introduces another variable underlying clitic placement ; the issue in (97a) is thus incorporated in §4.3. Subjunctive induction by negation involves questions on subcategorisation (cf. (97e)).

The assumption underlying semantic representations in FG is the following.

(98) Order of concatenation is not a variable conditioning the scope of quantifiers or of negation.

This position has been justified in (Jurie & Bès 1988) and (Gardent et al. 1989). The semantic formulas of FG incorporate thus neither "→" nor "⊥" of InL ; we will refer to them as InL'. An ad-hoc predicate *alsurdum* is instead used, whose argument is the index of a noun or a verb, and scope is not resolved within the grammar.

We return thus to issues (97a) and (97b).

Negative elements (i.e. neg - E = {ne, pas, (neg - XP)}) offer a good example of *non adjacent linearity relations* (or discontinuous relations). The basic (or minimal) observations that a grammar of French must cover are resumed in (99) and illustrated in (100) and (101).

(99) In the scope of a clause

(a) ne → pas V neg - XP

(b) pas → ne

(c) neg - XP → ne

(d) * ne (...) ne

(c) * pas (...) pas

(d) * pas (...) neg - XP

* neg - XP (...) pas

(100)(a) Jacques ne regarde pas Marie

Jacques ne regarde personne

Personne ne regarde Marie

Dans aucune ville personne ne donne aucun renseignement à personne

(b) * Personne regarde pas Marie

(c) * Personne regarde Marie

(d) * Jacques ne regarde Marie

(e) * Jacques ne les ne a pas donnés à Marie

(f) * Jacques ne les a pas donnés pas à Marie

(g) * Jacques ne regarde pas personne

(h) * Jacques donne aucun livre à personne

(i) * Jacques ne dit que Marie regarde pas Rose

* Jacques dit pas que Marie ne regarde Rose

* Personne dit que Marie ne regarde Rose

We are thus left with the three basic grammatical following situations.

(101)(a) ne ... pas

(b) ne ... neg - XP

neg - XP ... ne

(c) ne ... neg - XP^+

neg - XP^+ ... ne

neg - XP^+ ne ... neg - XP^+

The requirement of (99) must be fulfilled within the clause, as illustrated by (100 h). This fact is covered in FG by the analysis on unbounded dependencies (cf.

§4.7). The elements of FG presented in the following (102) account thus only for the situations illustrated by examples (100a) to (100 h).

(102)

	f domain												
	val 10	sign											
		5	12	5'	12'	6a	13a	6a'	13a'	6b	13b	6b'	13b'
passiv. -mod val (en)	–												
passiv. mod val (en)	Bn												
activ. val. XP -mod	–												
activ. val. XP mod	V												
activ rec val XP mod	V												
verb (en)		Bn	Bn			af	af			i	i		
activ. sign -neg E		V1	V1	V1	V1	V2	V2	V2	V2	V3	V3	V3	V3
activ. sign ne (en)		neg		neg		af *or* pa		ne		V4		V4	
activ. sign pas (en)		pa	pa	Bnb	Bnb	af	af	pa	pa	i	i	pa	pa
activ. sign neg - XP		neg	neg	neg	neg	ne	ne	ne	ne	i *or* neg	i *or* neg	neg	neg

where en : (lexical) entry

The specification of elements which are not necessarity lexical entries in (102) (i.e., 102c, 102d, 102e, 102g, 102j) will be justified in §4.4. We assume here that they are as described in (102). Wrt (102) observe that.

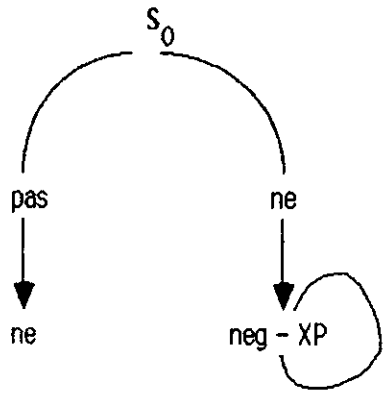
(a) White concatenating with a verbal sign, a *XP mod* transmits the value of f10 of the mod valency (cf. (102d) and (102e), and, below, §4.6).

(b) The class of constituents concatenating with a verbal sign is partitioned in two sub-classes, (neg - E) and (-neg - E). Only elements of the first class alter the values in f5 (12), 6a(13a) and 6b (13b) of the verbal sign.

The specifications (102b) to (102j) determine the possible orders in which neg - E can concatenate.

They are resumed in (103), where S_0 is a verbal sign with no neg - E.

(103)



From the order of concatenation and the effects produced in verbal signs by the concatenation of members of (neg - E), it is possible to calculate the negative structures specified by the grammar. They are resumed in (104), together with the structures that the grammar does not specify as grammatical.

(104)

						mod val	verbal sign			Obs coveral cf.	
ne	pas	neg - XP	ne⁺	pas⁺	neg - XP⁺	10	5(12)	6a(13a)	6b(13b)		
–	–	–	–	–	–	ßn	ßn	af	i	a	G
+	–	–	–	–	–	neg	ne	ne	i	b	* (100d)
–	+	–	–	–	–	pa	Bn	pa	pa	c	* (100b)
–	–	+	–	–	–	——	——	——	——	d	* (100c)
			+	–	–	——	——	——	——	e	* (100e)
			–	+	–	——	——	——	——	f	* (100f)
			–	–	+	——	——	——	——	g	* (100g)
–	+	+	–	–	–	——	——	——	——	h	* (100h)
+	+	–	–	–	–	pa	neg	ne	pa	i	(101a)
+	–	+	–	–	–	neg	neg	ne	neg	j	(101b)
+	–		–	–	+	neg	neg	ne	neg	k	(101c)
Input deletion rule						Bn	---	~pa	Bn	l	

G : grammatical, * : ungrammatical

wrt particular item :

+ : presence

– : absence

Inspection of the last two columns of (104) and comparison with (99) and (100) show that the grammar specifies all and only the structures defined in (99). (104a) exhibits the situation with no *neg - E* : all elements concatenated with the verbal sign are as specified in (102g), and the verbal sign presents the same structure of information in pertinent feature slots than the initial verbal entry. The grammar does not specify (104b) and (104c) thanks to the filtering power of the deletion rule, whose input is recalled in (104l). The grammar does not specify (104d) to (104h), because the conditions of concatenation of the specific neg - E involved in each case are not satisfied (cf. (102h) to (102j).